

dae; *Congeria leucophaeta* Conrad of the Dreissenidae; *Macoma balthica* (Linn.) of the Tellinidae; and *Mya arenaria* (Linn.) of the Myacidae.

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SHELL BEARING MARINE MOLLUSKS OF CAPE ANN, MASSACHUSETTS

BY ARTHUR H. CLARKE, JR.

During the past four years my wife and I have been collecting marine mollusks in the vicinity of Cape Ann. From beach collecting in all seasons and after storms, we have accumulated a fair number of species. Recently additional material obtained from fisherman's nets and from fish stomachs has increased the list considerably and has produced some interesting new records, including at least one new species.

Cape Ann is in Essex County, Massachusetts. It is approximately 35 miles northeast of Boston and fifteen miles south of the New Hampshire state line, and constitutes a prominent fea-

ture of the New England coastline, jutting out into the Atlantic for nearly twenty miles and forming the northern boundary of Massachusetts Bay. The only city on Cape Ann is historic Gloucester, still world famous as a leading fishing port and summer resort.

Most of Cape Ann is actually an island, cut off from the mainland by a narrow salt water passageway, the Annisquam River. The shore line is alternately sandy and rocky. To the north and east, the ocean bottom falls away gradually to 60 fathoms, approximately ten miles from shore, and is intermittently sand, mud and gravel or a mixture of all three.

It is in this general area that so much work has already been done. Mighels, Adams, Gould, Couthouy, Verrill, Morse, Winkley and others have collected extensively in this and nearby regions. The area is a relatively rich one for New England and is still a very fascinating territory to collect.

The most productive locality for beach collecting was found at Wingersheek Beach, Gloucester, facing northward into Ipswich Bay. It is typically New England in its topography, tremendous boulders and rocky outcrops are scattered in patches between stretches of fine sand. Northeast storms often litter the beach with shells, many of which may be from deep water or are rare species.

Extensive local gill net fishing also provides a good source of material. The fishing is done in nearby waters from 25 to 60 fathoms. The weighted edges of the nets lie on the bottom and mollusks, spider crabs, large sea anemones, and several species of starfish including the nine- to twelve-rayed *Solasters* and *Crossasters* are often accidentally drawn up. The most abundant invertebrate is the brachiopod *Terebratulina septentrionalis* Couthouy, found clinging to almost every solid object. Most of these animals are thrown overboard as soon as they come on board the boats, but some always escape and fall out on the pier where the nets are dried. Here they may be easily collected.

Recently we have been searching for shells in the stomachs and intestines of fish caught in these nets. Most of the shells were found in haddock but codfish also yielded many specimens. A large majority of the shells were found in the lower digestive

tracts; less than 10% were actually found in the stomachs. Many small shells which would probably have been overlooked were obtained by straining a water slurry of the intestinal contents through a fine wire mesh, rinsing with water and inspecting the residual material under a low power microscope.

Admittedly some uncertainty exists in regard to the proper locality of shells found in the fish, but W. F. Clapp has suggested, on the basis of convincing evidence, that shells collected in this manner can be regarded as probably from the area in which the fish were caught. (See *Nautilus* 25, 104, 1912.)

The following 103 species and 4 subspecies have been collected by my wife, Louise R. Clarke, and me during 1950 to 1953 from Cape Ann and nearby waters. It has been deemed impractical to list all known records from the area. Such a list would be beyond the scope of this paper and belongs in a larger, more comprehensive work. It is believed that the list is nearly complete for this area and presents a fairly accurate picture of relative abundance of species.

The following abbreviations are used:

- (G) Generally distributed over the entire coast of Cape Ann.
- (GS) Generally distributed after storms.
- (WB) Wingaersheek Beach Gloucester.
- (WBS) Wingaersheek Beach after storms.
- (GN) From gill nets used off Cape Ann, somewhere between 25 and 60 fathoms.
- (F25-60) From fish caught off Cape Ann, somewhere between 25-60 fath.
- (F28-40) From fish caught off Cape Ann, somewhere between 28-40 fath.
- (F52-54) From fish caught off Cape Ann, somewhere between 52-54 fath.

Lepidochiton (Tonicella) marmorea marmorea Fabricius. (GN) rare.

Solemya (Petrasma) borealis Totten. (WBS) uncommon.

Nucula proxima proxima Say. (F25-60, F28-40, F52-54) common.

N. tenuis tenuis Montagu. (F25-60, F28-40, F52-54) common.

N. delphinodonta Mighels and Adams. (F28-40) uncommon.

Nuculana tenuisulcata Couthouy. (GN, F25-60) rare.

- Yoldia sapotilla* Gould. (F25-60, F28-40, F52-54) common.
Y. (Megayoldia) thraciaeformis Storer. (F25-60, F28-40, F52-54) juveniles common.
Y. (Yoldiella) lucida Loven. (F25-60, F28-40, F52-54) common.
Pecten (Chlamys) islandicus islandicus Müller. (GN, F25-60, F28-40, F52-54) common.
P. (Aequipecten) irradians irradians Lamarck. (WBS) one broken valve, doubtless advectitious.
P. (Placopecten) grandis Solander. (WBS) rare; (GN, F25-60, F28-40, F52-54) common.
P. (species). (F25-60, F28-40, F52-54) common, tiny dark red specimens.
Anomia aculeata Müller. (GS) common among holdfasts of kelp; (F25-60, F28-40, F52-54) uncommon.
A. simplex d'Orbigny. (GS) uncommon among holdfasts of kelp; (F25-60) uncommon.
Mytilus edulis edulis Linné. (G) abundant.
M. edulis pelucidus Pennant. (G) common, with the preceding.
Modiolus modiolus Linné. (GS) common among holdfasts of kelp; (F25-60) juveniles uncommon.
M. (Brachidontes) demissus plicatulus Lamarck. (WB) common.
Modiolaria niger Gray. (GN) one specimen.
M. substriata Gray. (GN) uncommon.
Crenella decussata Montagu. (F25-60, F28-40, F52-54) uncommon.
C. glandula Totten. (F25-60, F28-40, F52-54) common.
Periploma (Cochlodesma) leanum Conrad. (WBS) uncommon.
Thracia conradi Couthouy. (WBS) juveniles uncommon, adults rare and always fragmentary.
T. truncata Mighels and Adams. (WB) one specimen.
Lyonsia hyalina Conrad. (WB) uncommon.
Cuspidaria glacialis Sars. (F25-60) uncommon.
C. obesa Loven. (F28-40, F52-54) uncommon.
Cyprina islandica Linné. (GS, GN) common; (F25-60, F28-40, F52-54) juveniles common.
Astarte castanea picea Gould. (GN) rare.
A. undata Gould. (GN, F25-60, F28-40, F52-54) common.
A. subaequilatera subaequilatera Sowerby. (GN, F25-60, F28-40, F52-54) common.
A. borealis Schumacher. (GN) common.
Venericardia borealis borealis Conrad. (GN, F25-60) common.
V. borealis novangliae Morse. (GN) uncommon.
Thyasira gouldii Philippi. (F52-54) common.
T. plana Verrill and Bush. (F52-54) uncommon.

- T. ferruginosa* Forbes. (F52-54) one specimen.
- Aligena elevata* Stimpson. (WBS) abundant 1-13-52. Rare on all other occasions.
- Clinocardium ciliatum* Fabricius. (GN) rare.
- Cerastoderma pinnulatum* Conrad. (F25-60, F28-40, F52-54) most abundant mollusk found in fish—purple, brown and yellow specimens common with typical white variety.
- Pitar morrhuana* Gould. (G) uncommon.
- Gemma gemma gemma* Totten. (G) common.
- Petricola (Petricolaria) pholadiformis pholadiformis* Lamareck. (WB) uncommon.
- P. (Petricolaria) pholadiformis lata* Dall. (WB) rare.
- Tellina (Angulus) tenera* Say. (G) abundant.
- Macoma balthica* Linné. (WB) uncommon. Inlets of Annisquam River, abundant.
- M. calcarea* Gmelin. (GN, F25-60, F28-40) common.
- Ensis directus* Conrad. (WB) common.
- Siliqua costata* Say. (WB) common.
- Spissula (Hemimactra) solidissima solidissima* Dillwyn. (WB) common.
- S. (Hemimactra) polynyma* Stimpson. (GN) uncommon.
- Mulinia lateralis lateralis* Say. (WB) rare. Inlets of Annisquam River, uncommon.
- Mesodesma arctatum* Conrad. Good Harbor Beach, Gloucester, common.
- Mya arenaria* Linné. (G) common. (F25-60, F28-40) small angular specimens common.
- Saxicava arctica* Linné. (G) common among holdfasts of kelp; (F25-60) uncommon.
- Panomys arctica* Lamareck. (GN) common.
- Cyrtodaria siliqua* Spengler. (WBS) common 11-28-51, rare on all other occasions; (GN) common.
- Xylophaga atlanticus* Richards. (GN) one specimen.
- Teredo navalis* Linné. (G) uncommon in floating wood.
- Acmaea testudinalis* Müller. (G) common.
- Lepeta caeca* Müller. (GN) one specimen.
- Puncturella princeps* Mighels and Adams. (F25-60, F28-40, F52-54) common.
- Solariella (Machaeroplax) obscura obscura* Couthouy. (F28-40) rare.
- Margarites helicina* Phipps. (WB) on kelp, rare.
- M. groenlandica* Gmelin. (F25-60, F28-40, F52-54) uncommon.
- M. (Pupillaria) cinerea cinerea* Couthouy. (F25-60, F28-40, F52-54) uncommon.
- Calliostoma occidentalis* Mighels and Adams. (F28-40) uncommon.

- Calliostoma* (species). (GN) one worn specimen, doubtless ad-
vectitious.
- Epitonium* (*Boreoscala*) *greenlandicum* Perry. (GN) rare;
(F25-60, F28-40, F52-54) uncommon.
- Turbonilla louiseae* (New species, description below). (F52-
54) one specimen.
- Natica* (*Tectonatica*) *clausa clausa* Broderip and Sowerby.
(F25-60) uncommon.
- Polinices* (*Euspira*) *heros* Say. (G) common.
- P.* (*Euspira*) *triseriata* Say. (WB) rare.
- P.* (*Euspira*) *groenlandica* Möller. (F28-40) rare.
- Velutina laevigata* Linné. (F25-60, F28-40, F52-54) common.
- Crepidula fornicata* Linné. (G) uncommon. Long Beach,
Gloucester, common.
- C. plana* Say. (G) uncommon; (GN) inside apertures of dead
Neptunea decemcostata Say, common.
- Alvania carinata* Mighels and Adams. (F28-40) one specimen.
- Littorina littorea* Linné. (G) abundant.
- L. obtusata* Linné. (G) common on shore rocks.
- L. saxatile saxatile* Olivi. (G) common on shore rocks.
- L. saxatile tenebrosa* Montagu. Inlets of Annisquam River,
common.
- Lacuna vineta vineta* Montagu. (G) common.
- Trichotropis borealis costellata* Couthouy. (F20-60) rare.
- Aporrhais occidentalis occidentalis* Beck. (WBS) rare; (GN)
uncommon.
- Thais lapilla lapilla* Linné. (G) common.
- Nassarius* (*Ilyanassa*) *obsoleta* Say. (WB) rare.
- N.* (*Tritia*) *trivittata* Say. (G) common.
- Buccinum undatum undatum* Linné. (WBS, GN) common;
(F20-60) uncommon.
- B. cyaneum cyaneum* Bruguière. (GN) one specimen, possibly
advectitious.
- Neptunea decemcostata* Say. (WBS) uncommon; (GN) com-
mon.
- Colus stimpsoni stimpsoni* Mörsch. (WBS) uncommon; (GN)
abundant.
- C. stimpsoni brevis* Verrill. (WBS) common.
- C.* (*Siphonorbis*) *pygmaeus* Gould. (F20-60, F28-40, F52-54
common.
- Lora scalaris scalaris* Möller. (F28-40) rare.
- L. decussata decussata* Couthouy. (GN, F20-60, F28-40, F52-
54) common.
- Pleurotomella* (species). One specimen, possibly undescribed.
- Admete couthouyi* Say. (F20-60, F28-40, F52-54) uncommon.

Retusa gouldii Couthouy. (F28-40) uncommon.

R. pertenuis Mighels. (F28-40) uncommon.

Diaphana debilis Gould. (F28-40) rare.

Cylichna (Bullinella) alba alba Brown. (F20-60) rare.

Limacina retroversa retroversa Fleming. (F52-54) rare.

Melampus lineatus Say. Inlets of Annisquam River, abundant.

A few species, generally common on northeast Massachusetts shores, were not found by us on Cape Ann. The most outstanding examples were:

Pandora gouldiana Dall. Common at West Beach, North Beverly, and Marblehead in 1-2 fathoms.

Zirphaea crispata Linné. Common at West Beach, North Beverly, and Salisbury Beach, Salisbury.

Polinices (Neverita) duplicata Say. Common at Dane Street Beach, Beverly. This locality seems to be the northern limit for this species.

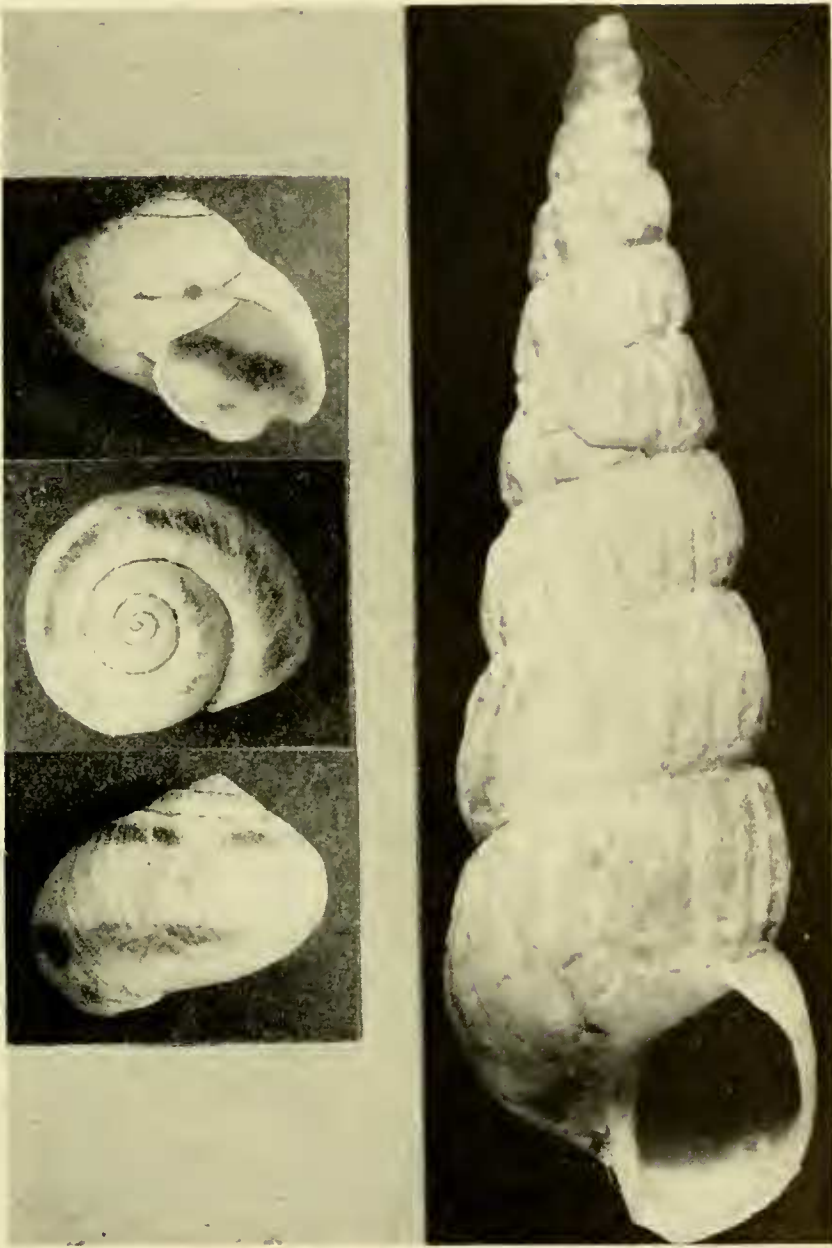
TURBONILLA LOUISEAE, new species

Plate 9, right figure

Shell gray, faintly lustrous, elongate and with a regularly tapering, acute spire. Periostracum thin, light brown. Whorls ten, uniformly rounded and impressed at the sutures. First three whorls smooth, fourth whorl crossed by 17 broad, rounded, straight light brown, prominent ribs separated by grooves. Ribs increasing in number and angularity on successive whorls to 28 on the body whorl where each rib has assumed a flattened sigmoid curve. Grooves equal to ribs in width but lighter in color. Ribs and grooves crossed by numerous fine, spiral lines, more distinct on the body whorl, but apparent on all ribbed whorls, especially in the grooves between the ribs. Aperture sub-ovate, lip thin, somewhat thickened at columella. Length 9 mm., width 2½ mm. (F52-54) One specimen.

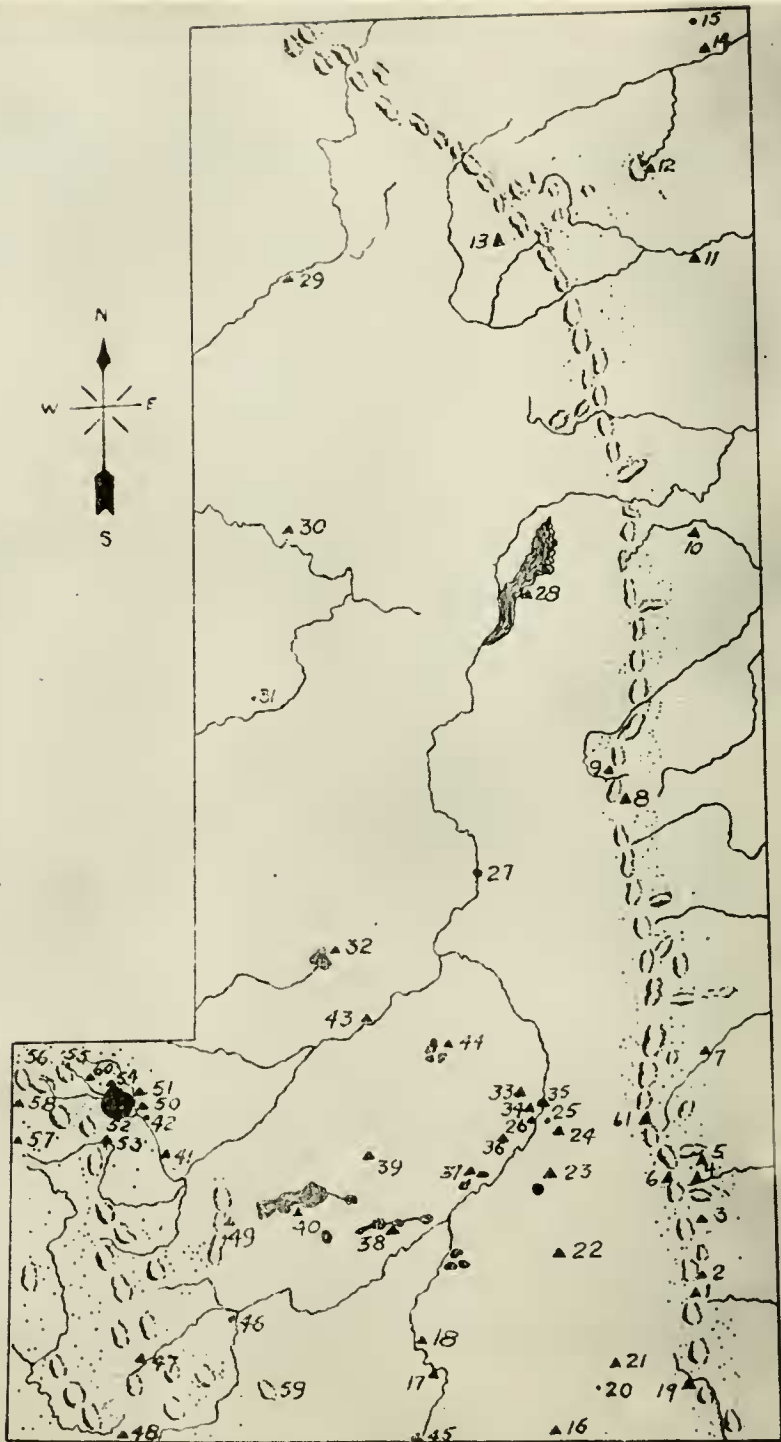
From shell characters alone, *T. louiseae* is apparently more closely related to *T. (Strioturbonilla) formosa* Verrill and Smith 1880 (= *T. bushiana* Verrill 1882) than to any other North Atlantic species. *T. formosa* has been recorded from off Georges Bank, Mass. and Long Island, N. Y. in 365 to 1525 fathoms. Several significant differences between the two species have been observed, however.

T. formosa is white, lustrous and iridescent while *T. louiseae* is gray, only faintly lustrous and not iridescent. No periostracum was seen on living specimens of *T. formosa* by Verrill;



Left 3 figs. *Humboldtiana edithae* Parodiz.

Right fig. *Turbonilla louiseae* Clarke.



ALBANY COUNTY, WYOMING

For key to numbers, see pages 128-129.